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CASE REPORT

Chorioamnionitis caused by *Morganella morganii* in a patient with recent infection by SARS-CoV-2: a case report*

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Abstract

To outline the case of a woman who experienced chorioamnionitis caused by *Morganella morganii* following a recent SARS-CoV-2 infection, resulting in a fatal neonatal outcome. A 36-year-old pregnant woman with a recent SARS-CoV-2 infection presented with uterine activity at 24.1 weeks' gestation. Maternal and fetal tachycardia and cervical changes suggestive of preterm labor were observed. Tocolytic therapy, lung maturation, magnesium sulfate, and broad-spectrum antibiotics were administered. Amniocentesis revealed *Morganella morganii* in the culture medium. Due to clinical chorioamnionitis and transverse fetal position, she underwent a cesarean section, resulting in a fatal neonatal outcome. Dual antibiotic therapy was administered without any maternal complications. Chorioamnionitis caused by *M. morganii* is a rare entity but represents a significant cause of morbidity in the maternal-fetal binomial. It is important to identify other comorbidities in pregnant women that can be considered as possible predisposing factors for this entity, so early identification and treatment should be sought.

Keywords: chorioamnionitis; *Morganella morganii*; pregnancy; SARS-CoV2.

Corioamnionitis por *Morganella morganii* en paciente con infección reciente por SARS-CoV-2: reporte de un caso

Resumen

Describir el caso de una mujer que desarrolló corioamnionitis por *Morganella morganii* tras una reciente infección por SARS-CoV-2, lo que resultó en un desenlace neonatal fatal. Una mujer embarazada de 36 años con reciente infección por SARS-CoV-2 presentó actividad uterina a las 24.1 semanas de gestación. Se observaron taquicardia materna y fetal, así como cambios cervicales sugestivos de trabajo de parto prematuro. Se inició terapia tocolítica, maduración pulmonar, sulfato de magnesio y antibióticos de amplio espectro. La amniocentesis reveló *Morganella morganii* en el cultivo. Debido a la corioamnionitis clínica y la posición fetal transversa, se realizó una cesárea, que resultó en un desenlace neonatal fatal. Se administró terapia antibiótica dual sin complicaciones maternas. La corioamnionitis causada por *M. morganii* es una entidad rara pero representa una causa significativa de morbilidad para el binomio materno-fetal. Es importante identificar otras comorbilidades en mujeres embarazadas que puedan considerarse factores de riesgo para esta entidad, por lo que se debe buscar una identificación y tratamiento tempranos.

Palabras clave: corioamnionitis; *Morganella morganii*; embarazo; SARS-CoV2.

Introduction

Morganella morganii, a facultative anaerobic gram-negative bacillus commonly found in the intestinal microbiome, is recognized as an opportunistic pathogen that causes urinary tract and intra-abdominal infections, particularly with biliary involvement[1]. Despite its association with neonatal sepsis, meningitis, and chorioamnionitis, observational studies have reported that it is a rare contributor to such cases[2]. Limited information is available regarding its pathogenesis and risk factors due to its rare presentation and lack of published literature[3].

This report presents the case of a 36-year-old pregnant woman who developed chorioamnionitis due to *Morganella morganii* in the context of a recent SARS-CoV-2 infection. This condition is associated with adverse neonatal outcomes.

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This report was approved by the ethics committee of the Fundación Valle del Lili under record number #04 of 2023. Informed consent was obtained for the review and publication of medical history information.

Case presentation

A 36-year-old Colombian woman, college-educated, gravida 2, with one previous cesarean section and mixed anxiety-depressive disorder treated with fluoxetine and clonazepam, was admitted to the obstetrics emergency room at 24.1 weeks of gestation due to a clinical presentation of three hours of leakage of mucous plug, vaginal bleeding, and irregular contraction-like abdominal pain. Her current pregnancy was complicated by a recent mild SARS-CoV-2 infection confirmed by a positive Polymerase Chain Reaction (PCR) test and ongoing treatment for a urinary tract infection with amoxicillin due to multisensitive *Enterococcus faecalis*.

Physical examination revealed the following findings: heart rate of 118 beats/min, temperature of 36,5 °C, blood pressure of 115/69 mmHg, normal respiratory rate, and oxygen saturation. No uterine activity was palpable, but cervical dilation of 3-4 cm was evident, with 70% effacement, and there were no signs of vaginal bleeding or amniorrhea. A quick Doppler ultrasound assessment showed a fetal heart rate of 170 bpm and transverse fetal position. Despite the pregnancy being considered far from term, antibiotic coverage was started with ceftriaxone and metronidazole, tocolysis with nifedipine, fetal neuroprotection with magnesium sulfate, and lung maturation with betamethasone. Initial paraclinical tests showed leukocytes 14.67 x103, neutrophils 13.05 x103, thrombocytosis of 500 x103/ ul, and C-reactive protein (CRP) 4.56 mg/dL. Given the evidence of a high leukocyte count at the expense of neutrophilia and elevated CRP, fetal and maternal tachycardia, amniocentesis was indicated, where cloudy fluid was evidenced. Given the transverse fetal position and clinical chorioamnionitis, an emergency cesarean section was performed. During surgery, fetid amniotic fluid was found, and a female product was delivered without tone or crying. Despite neonatal resuscitation efforts, indicated by an APGAR score of 1-0-0, the newborn did not survive. A very friable placenta and membranes were removed, requiring subsequent curettage during the cesarean section. Amniotic fluid cultures were obtained, and the placenta was sent for pathological examination. The family received support from the perinatal grief support team during this challenging period.

The amniotic fluid gram stain study showed abundant polymorphonuclear cells with gram-negative bacilli. Chemistry showed consumed glucose (<0,1 mg/dl), and an elevated deshydrogen lactic level. After 48 h, a positive amniotic fluid culture for *Morganella morganii* was reported, with intermediate resistance to ampicillin/sulbactam and imipenem, and susceptibility to cephalosporins. Antibiotic therapy was escalated to meropenem and vancomycin.

The patient developed distension and breast pain, and a breastfeeding inhibitor was initiated. Owing to clinical and paraclinical improvement 48 h later, and due to her improvement, antibiotic therapy was de-escalated to ertapenem. Outpatient management included intravenous antibiotics and consultations with an Infectiology and a High Obstetric Risk specialist. No adverse maternal outcomes were noted during follow-up. Placental pathology revealed extensive neutrophil infiltration in the chorion, acute chorioamnionitis, and increased perivellous fibrin, indicating a severe inflammatory response in the mother. No bacterial or viral inclusions were detected.

Discussion

Chorioamnionitis due to *Morganella morganii* is uncommon and is typically linked to *E. coli*, *Streptococcus*, and *Bacteroides* in cases of premature membrane rupture[4,5]. This opportunistic pathogen often affects immunosuppressed individuals, primarily in urinary tract infections, with rare cases involving vertical transmission and severe early onset neonatal infection[2].

The patient did not present with an immunosuppressed state typically associated with Morganella infections; however, she had a history of SARS-CoV-2 infection days before the onset of symptoms. SARS-COV2 infection activates the immune system, promoting a proinflammatory and prothrombotic state, which can translate into microvascular lesions and different degrees of fibrosis in various organs. However, the immune response triggered by this viral infection differs among individuals, and the combination of cytokines released may present an immune response of hyperimmunity or, on the contrary, a suppressive state. In addition, some types of autoimmunity have been described due to type II and type IV hypersensitivity reactions induced by the virus; these immunological conditions could generate an unpredictable response to secondary infections in the host[5]. To date, no association between infection by SARS-COV 2 and *M. morganii* infection has been reported in the literature.

Chorioamnionitis involves inflammation of the chorion and amnion, usually due to ascending genital tract infections. It can also arise from intrauterine inflammation, polymicrobial infections, biofilm formation, and dysregulated maternal immune responses, described as a "2-hit" behavior [6]. This condition has gained significance during the SARS-CoV-2 pandemic, highlighting the increased risk of adverse pregnancy outcomes in infected pregnant women [7]. Thus, it is essential to consider clinical findings in patients with suspec-

ted chorioamnionitis, which include maternal fever (≥37.8°C or 38.0°C) along with at least two of the following: increased maternal heart rate (>100 bpm), fetal tachycardia (>160 bpm), uterine tenderness, purulent or foul-smelling amniotic fluid or vaginal discharge, and elevated maternal white blood cell count (>15,000/mm^3). Additionally, several risk factors have been identified, including rupture of fetal membranes, prolonged labor, digital examinations, and a history of clinical chorioamnionitis in previous pregnancies[8].

Adverse perinatal and maternal outcomes associated with chorioamnionitis include, on the perinatal side, bronchopulmonary dysplasia, necrotizing enterocolitis, retinopathy of prematurity, intracerebral hemorrhage, periventricular leukomalacia, early-onset neonatal sepsis, and neonatal death. These outcomes may be associated with fetal inflammatory response syndrome, a condition described in intra-amniotic infections, characterized by elevated fetal plasma interleukin-6 levels secondary to a systemic inflammatory response[9,10]. *M. morganii* infection can be a serious cause of sepsis and can lead to life-threatening complications, such as meningitis and adult respiratory distress syndrome (ARDS) classically described in patients with some degree of immunosuppression[11]. Additionally, maternal sepsis associated with *Morganella morganii* should be treated to prevent intrapartum fetal death[3]. Cases of perinatal mortality related to this germ are few; however, they constitute a devastating outcome, as it happened in our case.

The management of chorioamnionitis typically starts with broad-spectrum antibiotics targeting aerobic and anaerobic organisms until *M. morganii* is definitively isolated and antibiotic sensitivity is determined, as in our case. Culture results guide antibiotic choice, given *M. morganii's* frequent resistance to many beta-lactams. Third-generation cephalosporins, alone or in combination with gentamicin for 10–14 days, are options for uncomplicated cases[12]. For complex cases, carbapenems are used as last-resort antibiotics against Enterobacteriaceae-related infections, a decision supported by our institution's multidisciplinary team of experts.

Standard treatment includes ampicillin with gentamicin or ampicillin with sulbactam. Cephalosporins and combinations, such as cefazolin with gentamicin or cefuroxime with metronidazole, have also been proposed. In cases of multidrug-resistant infections, ertapenem, meropenem, or imipenem-cilastatin are considered. While no regimen is clearly superior, combinations such as ceftriaxone, clarithromycin, and metronidazole, based on observational studies, may improve coverage, although their impact on neonatal microbiota and bacterial resistance should be considered[8,13].

This case report is the first description of the comorbidity of recent SARS-COV2 infection and *Morganella morganii* in a pregnant woman. However, this case report has a limited possibility of generalizing the therapeutic effects.

In conclusion, chorioamnionitis caused by *Morganella morganii* is a rare entity, but it represents a significant cause of morbidity for the maternal-fetal duo. The take-home lesson is the importance of identifying other comorbidities in pregnant women that can be considered as possible predisposing factors for this entity and thus, try to identify and treat it early.

Ethical considerations

Protection of persons. Written informed consent was obtained from the patient for the publication of this case report, and all procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Protection of vulnerable populations. Not applicable.

Confidentiality. The study protocol was approved by the Biomedical Research Ethics Committee of Fundación Valle del Lili (Institutional Review Board, Case report No. 647 from 14 of February, 2023).

Privacy. The authors affirm that no personal or sensitive patient information has been disclosed in this report. Patient privacy and confidentiality have been fully protected, with no use of names, initials, medical record numbers, or any other identifying details in the text.

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Authors´ contribution. N.C Riascos contributed to the conception of the main idea. N.C Riascos, J.J Saldarriaga, D.M Páez, A.M Hernandez and H. Gómez-Moreno, contributed to the acquisition, analysis and design of the paper. All authors contributed to read and approved the version of the submitted manuscript.

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